

Childhood Sexual Abuse and Cannabis Use in Early Adulthood: Findings from an Australian Birth Cohort Study

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ABSTRACT

Childhood sexual abuse (CSA) is associated with a wide range of health problems later in life. The impact of CSA on young adults’ use of cannabis remains under-studied. We examined the extent to which exposure to CSA was associated with increased rates of use of cannabis in early adulthood in a birth cohort of 3,285 Australian children followed-up to the age of 21 years, when retrospective reports of CSA were obtained from sample participants along with information on their use of cannabis at 21 years. Young adult men and women who reported experiencing CSA had significantly higher rates of frequent use of cannabis in early adulthood, defined as use of cannabis at least “every few days.” In multivariate analyses, men who reported a history of CSA had an odds ratio (OR) of 2.1 (95% CI = 1.1–3.9) for frequent use of cannabis at the age of 21 years. For women, there was an OR of 3.9 (95% CI = 2.4–6.3). Family and individual factors measured earlier in the study did not confound these associations. The findings suggest that children experiencing CSA have a substantially greater risk of use of cannabis and, in particular, its frequent use in early adulthood. Further research is required to explore factors that explain the pathway linking CSA and use of cannabis in early adulthood.

Keywords: Cannabis - Childhood sexual abuse - Young adulthood

INTRODUCTION

The consequences of childhood sexual abuse (CSA) include a range of adverse behaviors (Fergusson & Mullen, 1999). Two comprehensive reviews of the literature have suggested that a history of CSA is disproportionately common among individuals with sexual problems, aggression, anxiety, depression, withdrawn behavior, suicidal behavior, personality disorders, and substance abuse (Beitchman et al., 1992; Kendall-Tackett, Williams, & Finkelhor, 1993). However, Rind, Tromovitch, and Bauserman (1998) found that although

the relationship between CSA and poor psychological adjustment in adulthood was highly significant, the magnitude of the relationship was small.

The impact of CSA on use of illicit drugs has not been well investigated. The few available studies, mostly cross-sectional, have suggested a link between a history of CSA and the use of illicit drugs such as cannabis (Briere & Runtz, 1988; Burnam et al., 1988; Bushnell, Wells, & Oakley-Browne, 1992; Fergusson, Horwood, & Lynskey, 1996a; Harrison, Fulkerson, & Beebe, 1997; Mullen, Martin, Anderson, Romans, & Herbison, 1993; Sedney & Brooks, 1984; Winfield, George, Swartz, & Blazer, 1990). While there is evidence that individuals sexually abused as children are over-represented among substance users, there are several reasons why the association may not be causal.

First, some of the studies that have proposed an association between CSA and psychological outcomes were based upon attendees at psychiatric clinics and child guidance centers (Frank, Turner, Stewart, Jacob, & West, 1981). Such individuals can be expected to report symptoms of mental ill-health and the use of illicit drugs. Hence, selection bias might lead to overestimates of the strength of the association between CSA and use of illicit drugs. Second, some of the previous studies have relied on surveys of college or university students (Briere & Runtz, 1988). This method of sample selection may also lead to overestimates of the strength of the association between CSA and use of illicit drugs.

In addition, research assessing the outcomes of CSA has focused primarily on women (Briere & Runtz, 1988; Fergusson & Mullen, 1999; Finkelhor & Baron, 1986; Kendler et al., 2000; Wilsnack, Vogeltanz, Klassen, & Harris, 1997; Winfield et al., 1990). While evidence suggests that CSA is more common among women (Fergusson & Mullen, 1999; Finkelhor & Baron, 1986), men are more likely to use illicit drugs (Hall & Pacula, 2003). There have been few studies of the gender difference in any association between CSA and illicit drug use (Lynskey et al., 2002). In addition, not all studies that have included both genders have presented their findings separately for men and women (Burnam et al., 1988; Fergusson et al., 1996a). An exception is the study by Lynskey et al. (2002), who found that CSA was related to increased risk of cannabis dependence in women but not men.

The available community-based studies mostly employed cross-sectional designs that are not able to unravel the temporal sequence linking CSA and use of illicit substances (Bergen, Martin, Richardson, Allison, & Roeger, 2004; Bulik, Prescott, & Kendler, 2001; Burnam et al., 1988; Bushnell et al., 1992; Kendler et al., 2000; Wilsnack et al., 1997). Long-term prospective studies face difficulties in identifying relevant informants, who provide information about CSA plus ethical problems surrounding referral of abused children to treatment agencies (Fergusson & Mullen, 1999). Hence, in most longitudinal surveys, a history of CSA was sought retrospectively at the same time as use of illicit drugs was assessed (Fergusson & Mullen, 1999). When CSA and illicit drug use are reported by the same individual, there is a possibility that any association reflects recall bias, with those being more willing to report illicit drug problems also being more likely to report or disclose CSA.

In addition, any apparent link between CSA and use of illicit drugs may be attributable to confounding by social, family, and individual factors that are associated with both CSA and

increased risk of illicit drug problems (Mullen et al., 1993). Fergusson, Lynskey, and Horwood (1996b) suggested that the risk of CSA is greater among children reared in families characterized by parental conflict, high levels of paternal over-protection, low parental attachment, and parental substance use problems. These same factors are associated with subsequent illicit drug use, such as cannabis in offspring (Hayatbakhsh et al., 2006; Nicholson, Fergusson, & Horwood, 1999). To date, there have been limited efforts to control for those potential confounding variables (Fergusson & Mullen, 1999). Thus, it remains uncertain whether any statistical link between CSA and illicit drug use represents common causes or whether CSA lies along a causal pathway to drug abuse.

The present study addressed most of these deficits. It was based on a longitudinal birth cohort involving repeated assessments of children prior to the disclosure of CSA, making it possible to take into account prospectively measured potential confounders of any association of CSA and the use of cannabis. These included socioeconomic status (SES) of the family, maternal mental health, maternal substance use, and child mental health and problem behavior at the age of 14 years. Furthermore, the large sample size permitted assessment of gender differences in the association between CSA and cannabis use.

To date, only one study, an 18-year longitudinal investigation, has used this approach (Fergusson et al., 1996a). It examined the association between prospectively measured childhood and family circumstances and retrospective reports of CSA. The present study aimed to (1) identify the extent to which reports of CSA made at age 21 are related to use of cannabis in early adulthood; (2) examine whether any association between CSA and use of cannabis is a consequence of confounding factors; and (3) whether gender influences any association between CSA and use of cannabis in early adulthood.

METHOD

Participants

Data for the present analyses were from the Mater Hospital and the University of Queensland's Study of Pregnancy (MUSP) (Najman et al., 2005). The MUSP is a prospective study of women, and their offspring, who received antenatal care at one of the two major obstetric hospitals in Brisbane, Australia between 1981 and 1983. Of those who participated in the study, 7,223 women gave birth to a live singleton baby, who neither died nor was adopted prior to leaving hospital. Mothers were re-interviewed at 3–5 days post-delivery and again when the child was 6 months, 5, 14, and 21 years of age. Informed consent was obtained from the mother at all data collection phases and from the young adult at the 21-year follow-up. Ethics committees from the Mater Hospital and the University of Queensland approved each phase of the study. The present analysis was based on information for 3,285 young adults who, at the 21-year follow-up, provided information about cannabis use and experience of CSA, and for whom complete data were available at previous follow-ups.

MEASURES

Outcome variable

Consumption of cannabis was retrospectively assessed at the 21-year follow-up via a self-report questionnaire in which participants were asked, “In the last month, how often did you use cannabis, marijuana, pot, etc.?” Response options were: have never used at all, used every day, used every few days, used once or so in the last month, and did not use in the last month. Subsequently, those who reported use of cannabis were categorized into two groups: occasional users (once in the last month and not in the last month) and frequent users (at least every few days in the last month). A second question retrospectively sought the age at which participants started to use cannabis.

Childhood sexual abuse

We used three questions derived from the Los Angeles Epidemiologic Catchment Area project (Sorenson, Stein, Siegel, Golding, & Burnam, 1987) to assess overall experience of unwanted sexual contact. Participants were first asked: “Have you ever been pressured or forced to have sexual contact when you did not want to?” Those answering affirmatively were asked two more questions: “How many times did you have this experience before you were 16?” and “How many times did you have this experience after the age of 16?” On the basis of the number of such contacts before 16 years, participants were divided into three groups: none, once or twice, and three or more times. We also asked participants whether they had ever been raped and when the first rape occurred. Accordingly, they were divided into three groups: no rape, first raped before 16 years, and first raped after 16 years. Given that rape of men is so rare, this question was mainly examined for women. We used both experience of unwanted sexual contact before the age of 16 and experience of rape as measures of CSA.

Potential confounders

Our analyses included as indicators of SES the mother’s age (two categories: younger than 20 years and 20 years and over) and level of education (having post high school education, completed high school, and those who did not complete high school) when the child was born, and the gross family income at the 14-year follow-up. The 25th centile of income at the 14-year follow-up was the cut-off below which gross family income was defined as “low.”

Maternal marital status, quality of the parental relationship, and mother–child communication were used as indicators of family functioning. Maternal marital status was self-reported by mothers at the 14-year follow-up as being unpartnered or living with the child’s biological or step-father. The quality of partnered mothers’ marital relationships at 14 years was assessed using a short form of the Dyadic Adjustment Scale (DAS) (Spanier, 1976) (Cronbach’s $\alpha = 0.88$). Accordingly, mothers were divided into three categories: unpartnered group and partnered mothers with poor adjustment (top 20% with marital disagreement) or good adjustment. The Parent–Adolescent Communication Scale (Barnes & Olson, 1982) was used to assess mother–child communication at the 14-year follow-up (Cronbach’s $\alpha = 0.85$). Using a 20% cut-off, participants were divided into two groups: good and poor communication.

Maternal mental health at the 14-year follow-up was assessed using the short form of the Delusions-Symptoms-States Inventory (DSSI) (Bedford & Foulds, 1978). The DSSI has been widely used and its validity has been well established (Morey, 1985). In our sample, internal

consistency (Cronbach's α) for depression was 0.89 and for anxiety was 0.85. For the purpose of this study, mothers were classified as anxious or depressed if they reported three or more of seven symptoms related to anxiety or depression, respectively. Maternal cigarette smoking and alcohol consumption were assessed at the 14-year follow-up and mothers were classified as smokers/non-smokers and drinkers/abstainers.

Symptoms of problem behaviors in the adolescents at the 14-year follow-up were assessed using the Youth Self-Report (YSR) (Achenbach, 1991). The YSR is a self-report questionnaire for individuals aged 11–18 years that asks about “symptoms” in the last 6 months. It has been widely used as a measure of child and adolescent behavior problems in both clinical and research contexts. Subscales used in the current study included: internalizing behavior (consisting of items addressing withdrawn behavior, somatic complaints, and anxious/depressive behavior) (Cronbach's $\alpha = 0.86$); and externalizing behavior (consisting of aggression and delinquency) (Cronbach's $\alpha = 0.87$). In the current study, cases of problem behavior at the 14-year follow-up were defined using 10% cut-offs of scores on the relevant scale (Achenbach & Edelbrock, 1983). We also used a computerized version of the Composite International Diagnostic Interview (CIDI-Auto) (World Health Organization, 1993) at the 21-year follow-up to assess DSM-IV diagnoses of life-time major depression and anxiety disorders.

Statistical analyses

We used χ^2 tests and multinomial logistic regression to examine the association between a history of CSA and cannabis use (with or without other illicit drugs) in young adults, and also to explore the extent of cannabis use for categories of sexually abused individuals compared with the non-abused group. For the experience of rape, we excluded those who reported the first rape as occurring after 16 years of age. As a likelihood ratio test revealed no statistically significant difference between the results for men and women, we report the analyses for the overall sample. We fitted multivariate logistic models for 3,243 participants to examine the relationships with possible prospectively measured confounders taken into account. We first adjusted for gender, and mother's age and education when the child was born, and family income, maternal marital status and quality, family income, and mother–child communication at the 14-year follow-up (Model 1). Subsequent models progressively included maternal mental health and maternal smoking and alcohol consumption at 14-years (Model 2), and the adolescent's internalizing and externalizing behaviors at the 14-year phase (Model 3). All of the multivariate logistic models were conducted on the restricted sample with complete data. Odds ratios (ORs) and 95% confidence intervals (CIs) were used to estimate relative risks associated with potential explanatory factors.

We also conducted a series of complementary analyses to evaluate the validity of findings. First, to disentangle issues of temporal sequence, we excluded those who (at 21 years) reported use of cannabis before 16 years and re-examined the associations between CSA before the age of 16 and self-reported use of cannabis at age 21. Second, it is believed that current cannabis users, in particular frequent users, are more likely to have psychiatric disorders and to report both a history of CSA and use of other illicit drugs. To address this issue, we adjusted the association of self-reported CSA and use of cannabis for life-time measures of major depression and anxiety disorders assessed by the CIDI-Auto. To test the association between CSA and specifically current use of cannabis, we divided the

participants who had used cannabis after 16 years into two categories: non-current (not in the last month) and current (ranged between once in the last month to daily use) users of cannabis. Of 1,619 participants who had used cannabis, 774 (47.8%) reported use of other illicit drugs, including amphetamines, cocaine, heroin, and hallucinogens. We repeated all analyses after excluding those who had used illicit drugs other than cannabis from the sample. Finally, in a complementary analysis, we adjusted the association of history of CSA and use of cannabis at 21 years for family and individual factors measured at the 5-year follow-up of the study rather than at 14 years.

Participant attrition

Of the cohort of 4,872 mothers and children at the 14-year follow-up, 3,285 (67.4%) young adults completed the questionnaire related to CSA and use of cannabis at the 21-year follow-up. We used inverse probability weighting with robust estimates for standard errors to account for those lost to follow-up (Hogan, Roy, & Korkontzelou, 2004). Eleven individual and familial variables available at 14 years were included in this exploratory logistic regression model to determine whether those participants remaining in the study differed significantly from those who did not. Measures that predicted loss to follow-up at 21 years included the child's gender, mother's age, mother's education, family income, marital status and quality, maternal mental health and substance use, and child mental health at 14 years. The results from subsequent analyses, including inverse probability weighting based on these factors, did not differ materially from the unweighted analyses presented here, suggesting that our results were not substantially affected by selection bias related to loss to follow-up.

RESULTS

Of 3,285 young adults, 50.7% had never used cannabis by 21 years of age while 37.4% reported occasional use and the remaining 11.9% reported frequent use of cannabis in the month preceding the survey (Table 1). Men were more likely to use cannabis at all and to use it frequently, whereas more women were occasional users of cannabis. Overall, 9.2% of young adults (4.4% men and 13.5% women) reported one or more experiences of forced or pressured sexual contact before 16 years, and women were more likely to report being raped (5.1%) before 16 years compared with men (0.9%). Thus, men were more likely to report frequent use of cannabis while a greater proportion of women had experienced CSA.

Table 1: Young adults' cannabis use at 21 years and rates of self-reported childhood sexual abuse

Variables ^a	Proportion positive on variable (in %)		
	Male (n = 1,575)	Female (n = 1,710)	Combined (n = 3,285)
Use of cannabis ^b			
Never used	47.9	53.3	50.7
Occasional use	34.3	40.2	37.4

Variables ^a	Proportion positive on variable (in %)		
	Male (n = 1,575)	Female (n = 1,710)	Combined (n = 3,285)
Frequent use	17.7	6.5	11.9
Pressured or forced sexual contact before 16 years ^b			
None	95.6	86.5	90.8
Once or twice	2.5	8.4	5.6
Three or more episodes	1.9	5.1	3.6
Being raped by 16 years ^b			
No	99.1	94.9	97.0
Yes	0.9	5.1	3.0

^aSelf-report at 21 years^bLevel of significance for gender difference, $p < .001$

Table 2 shows the association between young adults' self-reports of CSA and cannabis use. In unadjusted analyses, young adults who had experienced CSA had a substantially increased risk of frequent use of cannabis in early adulthood and those who had experienced CSA three or more times were more likely to use cannabis frequently (odds ratio (OR) = 3.3; 95% CI: 1.9, 5.7) compared with those who reported less than three experiences (OR = 2.2; 95% CI: 1.5, 3.5). A similar pattern was found for the association between frequency of cannabis use and having been raped before 16 years.

Table 2: Young adults' cannabis use by self-reported history of childhood sexual abuse

Variables	N	Young adults' cannabis use				
		Pattern of cannabis use within each group (%)			Unadjusted OR (95% CI) ^a	
		Never use	Occasional use	Frequent use	Occasional use	Frequent use
Forced or pressured sexual contact before 16 years						
None	2,984	52.4	36.5	11.2	1.0	1.0
Once or twice	183	37.7	44.3	18.0	1.7 (1.2–2.3)	2.2 (1.5–3.5)
Three or more episodes	118	28.8	50.8	20.3	2.5 (1.7–3.9)	3.3 (1.9–5.7)
Being raped by 16 years						
No	3,132	51.4	36.8	11.8	1.0	1.0
Yes	111	31.5	48.6	19.8	2.2 (1.4–3.3)	2.7 (1.6–4.7)

^aNever use of cannabis and no abuse/no rape as the reference category

Table 3 shows the relationships between CSA and the occasional and frequent use of cannabis after controlling for possible confounding factors. In Model 1, there was a strong and consistent association between CSA and use of cannabis. Further adjustment for maternal mental health and maternal substance use (Model 2) and child's internalizing and externalizing behaviors (Model 3) did not significantly alter the association between CSA and use of cannabis. The data in Table 3 indicated that the association between CSA and cannabis use was not confounded by a range of family and individual factors prospectively measured at 14 years.

Table 3: Adjusted risk of young adults' cannabis use by history of childhood sexual abuse

Young adults' cannabis use						
Adjusted OR (95% CI) ^a						
	Model 1 ^b		Model 2 ^c		Model 3 ^d	
	Occasional use	Frequent use	Occasional use	Frequent use	Occasional use	Frequent use
Forced or pressured sexual contact before 16 years						
None	1.0	1.0	1.0	1.0	1.0	1.0
Once or twice	1.6 (1.1–2.2)	3.1 (2.0–5.0)	1.5 (1.1–2.1)	3.0 (1.9–4.8)	1.4 (1.0–2.0)	2.8 (1.7–4.4)
Three or more episodes	2.3 (1.5–3.5)	4.1 (2.4–7.3)	2.2 (1.4–3.4)	3.9 (2.2–6.8)	2.1 (1.4–3.3)	3.6 (2.0–6.4)
Being raped by 16 years						
No	1.0	1.0	1.0	1.0	1.0	1.0
Yes	1.9 (1.2–3.0)	4.0 (2.2–7.1)	1.8 (1.2–2.9)	3.7 (2.1–6.6)	1.6 (1.0–2.6)	3.1 (1.7–5.8)

^aNever use of cannabis and no abuse/no rape as the reference category

^bCovariates: Gender, Mother's age and mother's education measured at the child's birth, and family income, marital status and quality, and mother–child communication measured at 14 years

^cCovariates: Model 1 plus maternal anxiety, depression, smoking, and alcohol consumption measured at 14 years

^dCovariates: Model 2 plus child internalizing and externalizing measured at 14 years

Due to the very small number of men who reported being raped before 16 years, it was not possible to distinguish the association of rape with use of cannabis by gender. Thus, Table 4 compares only the risk of young men's and women's use of cannabis according to their experience of forced or pressured sexual contact before 16 years. In multivariate analysis, history of CSA before 16 years was associated with a somewhat greater risk of frequent use of cannabis in early adulthood (OR = 3.9; 95% CI: 2.4, 6.3) and for women compared with men (OR = 2.1; 95% CI: 1.1, 3.9).

Table 4: Gender difference in risk of young adults' cannabis use by history of sexual abuse adjusted for all covariates at 14 years^a

Forced or pressured sexual contact before 16 years			Young adults' cannabis use at 21 years			
			Occasional use		Frequent use	
			OR	95% CI	OR	95% CI
Men						
No	1,505		1.0		1.0	
Yes	70		1.3	0.7–2.3	2.1	1.1–3.9
Women						
No	1,479		1.0		1.0	
Yes	231		1.7	1.3–2.4	3.9	2.4–6.3

^aCovariates: Mother's age and education, family income, marital status and quality, maternal anxiety and depression, maternal substance use, and child internalizing and externalizing at 14 years

Sensitivity analyses

There were four potential threats to the validity of these results: the temporality of association, confounding effects of background factors, recall bias in self-report of CSA, and misclassification of CSA. In our sample, 42.2% (N = 684) of cannabis users (as measured at 21 years) had started to use cannabis before 16 years. When we excluded these individuals from the sample and repeated the analyses, the multivariate regression showed a similar pattern of point estimates for risk of occasional and frequent use of cannabis. Those who

reported three or more experiences of CSA before 16 years had an OR of 3.7 (95% CI: 1.7, 7.8) for frequent use of cannabis in early adulthood, compared with an OR of 3.6 (95% CI: 2.0, 6.4) in the original fully adjusted model in Table 3.

Regarding the issue of recall bias, there is evidence suggesting that use of illicit drugs, including cannabis, is associated with psychiatric disorders (Hall & Pacula, 2003), and that persons with psychiatric illness are more likely to recall and report experiences of sexual abuse (Tennant, 1983). To address this issue, we further adjusted the association of self-reported CSA and use of cannabis for life-time measures of major depression and anxiety disorders. The associations remained effectively unaltered (OR = 2.4; 95% CI: 1.4, 4.3) for one or two episode of CSA and OR = 3.8 (95% CI: 1.8, 7.8) for three or more experiences of CSA. We also examined the relationship between CSA and non-current/current use of cannabis. Our data showed similar association of CSA with non-current and current use of cannabis. In a further sensitivity analysis, we excluded those who reported use of illicit drugs other than cannabis and repeated the regression models. The results we obtained did not differ materially from those we have presented. This suggests the findings in Table 3 were independent of two major factors that may produce bias in estimates of the association between CSA and use of cannabis.

In the analyses already described, we controlled for an extensive range of variables measured prospectively at the 14-year follow-up. One might argue that family factors earlier in life may be related to risk of both CSA and use of cannabis. In order to assess this, we conducted an additional analysis in which we adjusted the association of history of CSA and use of cannabis at 21 years for family and individual factors measured at the 5-year follow-up of the study rather than at 14 years. This analysis took into account measures of family functioning, maternal mental health, maternal use of legal and illegal substances, and child mental health and problem behavior assessed when the child was 5 years old. These findings were not different from those presented here.

DISCUSSION

We have used data collected over the course of a 21-year birth cohort study to examine whether exposure to CSA predicted use of cannabis in early adulthood. Our findings suggested that the experience of CSA was associated with increased risk of use and more frequent use of cannabis in early adulthood. Further, CSA predicted young adults' cannabis use independently of and in combination with other illicit drugs. We also found that, compared with men, women were both more likely to report a history of CSA and to show a greater risk of cannabis use associated with CSA.

Our data were consistent with those from previous cross-sectional and longitudinal studies indicating that CSA is associated with increased risk of illicit drug use or disorders (Bergen et al., 2004; Bulik et al., 2001; Fergusson et al., 1996a; Harrison et al., 1997; Kendler et al., 2000; Mullen et al., 1993; Wilsnack et al., 1997). However, Widom, Weiler, and Cottler (1999) suggested that although cross-sectional measurement of child abuse predicts drug abuse, prospectively ascertained child abuse is not associated with later development of drug abuse. Differences in assessment of exposure (Widom et al. studied cases of abuse and

neglect rather than sexual abuse) and outcome (abuse of any illicit drugs rather than frequency of cannabis use) may be a reason for the discrepancy in the findings.

While both CSA and use of cannabis may be outcomes of other common factors, such as SES, family functioning, maternal mental health and substance use, and child mental health and substance use, our analyses suggested that these family and individual factors did not confound the association between CSA and use of cannabis.

A second possible explanation is that young adults who frequently use cannabis are at increased risk of psychiatric problems and therefore more likely to recall or report experience of CSA. While we could not eliminate this possibility using the present design, controlling for life-time major depression and anxiety did not materially alter our findings.

In regard to explanatory pathways, Alexander (1992) proposed that CSA leads to poor parent–child attachment, making the child prone to peer pressures and involvement in drug problems (Hoffmann, 1993). In addition, as an extension of the self-medication hypothesis proposed by some researchers (Khantzian, 1997), substance use might be a coping strategy adopted by sexually abused individuals to help them adapt to their early childhood trauma and to distance themselves from what they experienced. However, evidence for (or against) these proposed mechanisms is sparse and our data did not allow us to examine these possible pathways.

Our findings should be interpreted in the context of several limitations. First, the sizeable loss to follow-up in the study between the 14- and 21-year surveys (32.6%) raises the possibility of bias in estimation of the magnitude of associations. The apparent relationship between CSA and use of cannabis could be misleading if those lost to follow-up were unrepresentative in terms of their experience of CSA and cannabis use. We have found, in our sample, that those lost to follow-up tend to have poorer mental health, lower SES, and greater use of tobacco and alcohol (Najman et al., 2005). If these variables were related to CSA and cannabis use, then we might have under-estimated the strength of the association of primary interest. On the other hand, if loss to follow-up was greater for those who have not experienced CSA and did not use cannabis, we might have over-estimated the strength of the primary association. Recent detailed analyses concerned with loss to follow-up bias in estimates of relative risk in this cohort suggested that the former possibility was more likely to be the case, and it is possible that our findings constitute a modest under-estimate of the true associations (Najman et al., 2005).

We conducted a sensitivity analysis to test whether loss to follow-up affected the findings of present study. Drop-out in the study was associated with SES, family functioning, maternal mental health, maternal smoking, adolescent smoking, and alcohol consumption at 14 years. Assuming missing-at-random, we used the method of inverse probability weighting (Hogan et al., 2004) to test whether loss to follow-up was likely to have had any impact on the findings. The associations emerging from analyses weighted by inverse probabilities did not differ from those of the unweighted analyses, suggesting that our results were not substantially affected by attrition bias.

Although we attempted, by means of several sensitivity analyses, to assess the robustness of findings, retrospective reports of sexual abuse may be affected by failure to recall past experiences accurately and the age at which these events first took place. In addition, we did not know at what age before 16 the abuse occurred and whether it included physical force or not. Therefore, it is clear that conclusions about the role of CSA in the risk of young adults' cannabis use should be made cautiously. If one accepts that CSA makes children and adolescents more prone to use of cannabis and other illicit drugs, this has significant implications for the treatment and prevention of use of illicit drugs, in particular cannabis, in young adults. For example, clinicians and programs serving substance abusers should add or expand components of treatment that specifically address the needs of CSA individuals, and evaluate the effectiveness of these programs. Early detection of sexually abused children, and further research on effective intervention models for these groups, could help reduce the risk of cannabis use and its negative consequences in adolescence and adulthood.

Overall, within the limitations that apply to studies of CSA based on information from self-reports, the present study suggested three main conclusions: (1) that CSA was associated with increased risk of use of cannabis and its frequent use in early adulthood; (2) the experience of CSA by women predicted greater risk of use of cannabis in early adulthood compared with men; and (3) the relationship between CSA and cannabis use was not explained by a range of possible confounding factors. Prospective research into the pathway linking CSA and use of cannabis might provide essential information for programs to prevent use of illicit drugs.

REFERENCES

Achenbach, T. M. (1991). *Manual for the Youth Self-Report and 1991 Profile*. Burlington, VT: University of Vermont Department of Psychiatry.

Achenbach, T. M., & Edelbrock, C. (1983). *Manual for the Child Behavior Checklist and Revised Child Behavior Profile*. Burlington: University of Vermont Department of Psychiatry.

Alexander, P. C. (1992). Application of attachment theory to the study of sexual abuse. *Journal of Consulting and Clinical Psychology*, 60, 185–195.

Barnes, H., & Olson, D. H. (1982). Parent-adolescent communication. In D. H. Olson, H. I. McCubbin, H. Barnes, A. Larsen, M. Muxen, & M. Wilson (Eds.), *Family inventories: Inventories used in a national survey of families across the family life cycle* (pp. 33–48). St. Paul: Family Social Science, University of Minnesota.

Bedford, A., & Foulds, G. (1978). *Delusions-symptoms-states inventory of anxiety and depression*. Windsor, England: NFER.

Beitchman, J. H., Zucker, K. J., Hood, J. E., DaCosta, G. A., Akman, D., & Cassavia, E. (1992). A review of the long-term effects of child sexual abuse. *Child Abuse and Neglect*, 16, 101–118.

Bergen, H. A., Martin, G., Richardson, A. S., Allison, S., & Roeger, L. (2004). Sexual abuse, antisocial behaviour and substance use: Gender differences in young community adolescents. *Australian and New Zealand Journal of Psychiatry*, 38, 34–41.

Briere, J., & Runtz, M. (1988). Symptomatology associated with childhood sexual victimization in a nonclinical adult sample. *Child Abuse and Neglect*, 12, 51–59.

Bulik, C. M., Prescott, C. A., & Kendler, K. S. (2001). Features of childhood sexual abuse and the development of psychiatric and substance use disorders. *British Journal of Psychiatry*, 179, 444–449.

Burnam, M. A., Stein, J. A., Golding, J. M., Siegel, J. M., Sorenson, S. B., Forsythe, A. B., et al. (1988). Sexual assault and mental disorders in a community population. *Journal of Consulting and Clinical Psychology*, 56, 843–850.

Bushnell, J. A., Wells, J. E., & Oakley-Browne, M. A. (1992). Long-term effects of intrafamilial sexual abuse in childhood. *Acta Psychiatrica Scandinavica*, 85, 136–142.

Fergusson, D. M., Horwood, L. J., & Lynskey, M. T. (1996a). Childhood sexual abuse and psychiatric disorder in young adulthood: II. Psychiatric outcomes of childhood sexual abuse. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 1365–1374.

Fergusson, D. M., Lynskey, M. T., & Horwood, L. J. (1996b). Childhood sexual abuse and psychiatric disorder in young adulthood: I. Prevalence of sexual abuse and factors associated with sexual abuse. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 1355–1364.

Fergusson, D. M., & Mullen, P. E. (1999). *Childhood sexual abuse. An evidence based perspective*. Thousand Oaks, CA: Sage Publications.

Finkelhor, D., & Baron, L. (1986). High risk children. In D. Finkelhor & Araj (Eds.), *A sourcebook on child sexual abuse* (pp. 60–88). Beverly Hills, CA: Sage Publications.

Frank, E., Turner, S. M., Stewart, B. D., Jacob, M., & West, D. (1981). Past psychiatric symptoms and the response to sexual assault. *Comprehensive Psychiatry*, 22, 479–487.

Hall, W., & Pacula, R. L. (2003). *Cannabis use and dependence: Public health and public policy*. Cambridge: Cambridge University Press.

Harrison, P. A., Fulkerson, J. A., & Beebe, T. J. (1997). Multiple substance use among adolescent physical and sexual abuse victims. *Child Abuse and Neglect*, 21, 529–539.

Hayatbakhsh, M. R., Najman, J. M., Jamrozik, K., Mamun, A. A., Williams, G. M., & Alati, R. (2006). Changes in maternal marital status are associated with young adults' cannabis use: Evidence from a 21-year follow-up of a birth cohort. *International Journal of Epidemiology*, 35, 673–679.

Hoffmann, J. P. (1993). Exploring the direct and indirect family effects on adolescent drug-use. *Journal of Drug Issues*, 23, 535–557.

Hogan, J. W., Roy, J., & Korkontzelou, C. (2004). Handling drop-out in longitudinal studies. *Statistics in Medicine*, 23, 1455–1497.

- Kendall-Tackett, K. A., Williams, L. M., & Finkelhor, D. (1993). Impact of sexual abuse on children: A review and synthesis of recent empirical studies. *Psychological Bulletin*, 113, 164–180.
- Kendler, K. S., Bulik, C. M., Silberg, J., Hettema, J. M., Myers, J., & Prescott, C. A. (2000). Childhood sexual abuse and adult psychiatric and substance use disorders in women: An epidemiological and cotwin control analysis. *Archives of General Psychiatry*, 57, 953–959.
- Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: A reconsideration and recent applications. *Harvard Review of Psychiatry*, 4, 231–244.
- Lynskey, M. T., Heath, A. C., Nelson, E. C., Bucholz, K. K., Madden, P. A. F., Slutske, W. S., et al. (2002). Genetic and environmental contributions to cannabis dependence in a national young adult twin sample. *Psychological Medicine*, 32, 195–207.
- Morey, L. C. (1985). A comparative validation of the Foulds and Bedford hierarchy of psychiatric symptomatology. *British Journal of Psychiatry*, 146, 424–428.
- Mullen, P. E., Martin, J. L., Anderson, J. C., Romans, S. E., & Herbison, G. P. (1993). Childhood sexual abuse and mental health in adult life. *British Journal of Psychiatry*, 163, 721–732.
- Najman, J. M., Bor, W., O’Callaghan, M., Williams, G. M., Aird, R., & Shuttlewood, G. (2005). Cohort profile: The Mater-University of Queensland study of pregnancy (MUSP). *International Journal of Epidemiology*, 34, 992–997.
- Nicholson, J. M., Fergusson, D. M., & Horwood, L. J. (1999). Effects on later adjustment of living in a stepfamily during childhood and adolescence. *Journal of Child Psychology and Psychiatry*, 40, 405–416.
- Rind, B., Tromovitch, P., & Bauserman, R. (1998). A meta-analytic examination of assumed properties of child sexual abuse using college samples. *Psychological Bulletin*, 124, 22–53.
- Sedney, M. A., & Brooks, B. (1984). Factors associated with a history of childhood sexual experience in a nonclinical female population. *Journal of the American Academy of Child and Adolescent Psychiatry*, 23, 215–218.
- Sorenson, S. B., Stein, J. A., Siegel, J. M., Golding, J. M., & Burnam, M. A. (1987). The prevalence of adult sexual assault: The Los Angeles Epidemiologic Catchment Area project. *American Journal of Epidemiology*, 126, 1154–1164.
- Spanier, G. B. (1976). Measuring dyadic adjustment: New scales for assessing the quality of marriage and similar dyads. *Journal of Marriage and the Family*, 38, 15–28.
- Tennant, C. (1983). Life events and psychological morbidity: The evidence from prospective studies. *Psychological Medicine*, 13, 483–486.
- Widom, C. S., Weiler, B. L., & Cottler, L. B. (1999). Childhood victimization and drug abuse: A comparison of prospective and retrospective findings. *Journal of Consulting and Clinical Psychology*, 67, 867–880.
- Wilsnack, S. C., Vogeltanz, N. D., Klassen, A. D., & Harris, T. R. (1997). Childhood sexual abuse and women’s substance abuse: National survey findings. *Journal of Studies on Alcohol*, 58, 264–271.
- Winfield, I., George, L. K., Swartz, M., & Blazer, D. G. (1990). Sexual assault and psychiatric

disorders among a community sample of women. *American Journal of Psychiatry*, 147, 335–341.

World Health Organization. (1993). *CIDI-Auto Version 1.1: administrator's guide and reference*. Sydney: Training and Reference Centre for WHO CIDI.